

Rec'd PCT/PTO 20 JUL 2004

We claim:

- 5 1. A process for preparing alkenylaromatic compounds by reacting alkylaromatic compounds in the presence of steam and natural gas or methane over a suitable catalyst at a temperature of from 400 to 800°C and a pressure of from 0.01 to 10 bar, wherein the molar ratio of steam to alkylaromatic compound is from 6.9:1 to 1:1.
- 10 2. A process for preparing alkenylaromatic compounds as claimed in claim 1, wherein the molar ratio of steam to alkylaromatic compound is from 5.95:1 to 2:1.
- 15 3. A process for preparing alkenylaromatic compounds as claimed in claim 1, wherein the molar ratio of steam to alkylaromatic compound is from 5.9:1 to 2.5:1.
- 20 4. A process for preparing alkenylaromatic compounds by reacting alkylaromatic compounds in the presence of steam and natural gas over methane over a suitable catalyst at a temperature of from 400 to 800°C and a pressure of from 0.01 to 10 bar, wherein the molar ratio of methane to alkylaromatic compound is from 0.1:1 to 8:1.
- 25 5. A process for preparing alkenylaromatic compounds claim 4, wherein the molar ratio of methane to alkylaromatic compound is from 0.2:1 to 6:1.
- 30 6. A process for preparing alkenylaromatic compounds as claimed in any of claims 1, 2, 3, 4 or 5, wherein the reaction is carried out in from two to six steps.
- 35 7. A process for preparing alkenylaromatic compounds as claimed in any of claims 1, 2, 3, 4, 5 or 6, wherein the alkylaromatic compound used is isopropylbenzene, ethylbenzene, 1,1-diphenylethane or an alkylpyridine compound.
- 40 8. A process for preparing alkenylaromatic compounds as claimed in any of claims 1, 2, 3, 4, 5 or 6, wherein the hydrocarbon compound used is ethylbenzene.

9. A process for preparing alkenylaromatic compounds as claimed in any of claims 1, 2, 3, 4, 5, 6, 7 or 8, wherein the natural gas comprises at least 90 vol% of methane.

5 10. A process for preparing alkenylaromatic compounds as claimed in any of claims 1, 2, 3, 4, 5, 6, 7, 8 or 9, wherein the reaction is carried out in radial flow reactors.

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